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EVALUATION OF MOUNTAIN PINE BEETLE INFESTATIONS YELLOWSTONE NATIONAL PARK, WYOMING, 1971

by

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ABSTRACT

The mountain pine beetle, *Dendroctonus ponderosae* Hopk., showed a significant advance northward from the 1970 infestation boundary, encompassing almost one-third of the total Park acreage. A fall survey conducted in the Park showed an average of 71.1 trees per acre with red or fading foliage from previous year's attacks and 35.8 actively infested trees per acre attacked in 1971. Stocking levels were reduced from 276.2 trees per acre to 169.2 trees per acre.

INTRODUCTION

The mountain pine beetle, *Dendroctonus ponderosae* Hopk., has caused heavy losses to whitebark, limber, and lodgepole pine stands in Yellowstone National Park during the past 30 years. The last reported outbreak began in 1931 in the northwest corner of the Park and subsided in 1947. Gibson (1947) reported that surveys during the outbreak showed losses in limber pine equal to about 10 percent of the total stand. When the outbreak subsided in 1947, number of infested trees averaged 0.06 per acre.

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The present infestation extended from the adjoining Targhee National Forest in Idaho into lodgepole pine stands in the Cave Falls-Bechler River area in the southwest corner of Yellowstone National Park in 1966. During a 5-year period through 1970, the infestation spread north through the Cascade corner and to the Pitchstone Plateau (Fig. 1).

In 1971, a forefront of the heavy mountain pine beetle infestation advanced across whitebark pine stands on the Pitchstone Plateau, and in lodgepole pine stands along the west boundary of the Park to the Montana-Idaho line, northeast to Geyser Basin, and east to the southeast arm of Yellowstone Lake. Heavy infestation now encompasses over 450,000 acres of lodgepole and whitebark pine stands (Fig. 1).

METHODS

Seventeen 1-square-mile blocks were selected throughout the infested area in 1971 to measure volume loss and number of trees killed per acre in older and more recently infested areas.

Ground surveys were conducted by National Park Service personnel using a variable plot basal area cruise. A total of 20,340 acres were surveyed (Fig. 2). Plots were located at 5-chain intervals along a randomly placed 3-mile strip within each 640-acre block. A wedge prism (BA factor 20) was used to tally trees. Trees occurring in each plot were recorded as to species, d.b.h., total height, year attacked by mountain pine beetle, or green. Survey data were analyzed by computer using a modified Region 1 sale cruise program.

RESULTS

The coniferous stand in the surveyed blocks is composed of approximately 83.4 percent lodgepole pine, 8.6 percent Engelmann spruce, 7.0 percent alpine fir, 23.7 percent whitebark pine and limber pine, and 0.24 percent aspen. Ecological habitat types vary from the pine grass type, *Pseudotsuga menziesii/Calamagrostis rubescens* at the lower elevations (6,100 feet) to the higher habitat type of *Abies lasiocarpa/Vaccinium* at the higher elevations (8,900 feet).

Mountain pine beetle infestation levels varied considerably between surveyed areas. The highest level of infestation occurred at Horseshoe Lake where 63.0 lodgepole pine were infested per acre in 1971. In this same area in 1970, the number of red topped and fading lodgepole pines averaged 213.6 trees per acre. The Robinson Creek block ranked second with 62.0 trees infested per acre in 1971, while only 32.1 were infested per acre in 1970. Lodgepole pine comprises 95 percent of the stand in

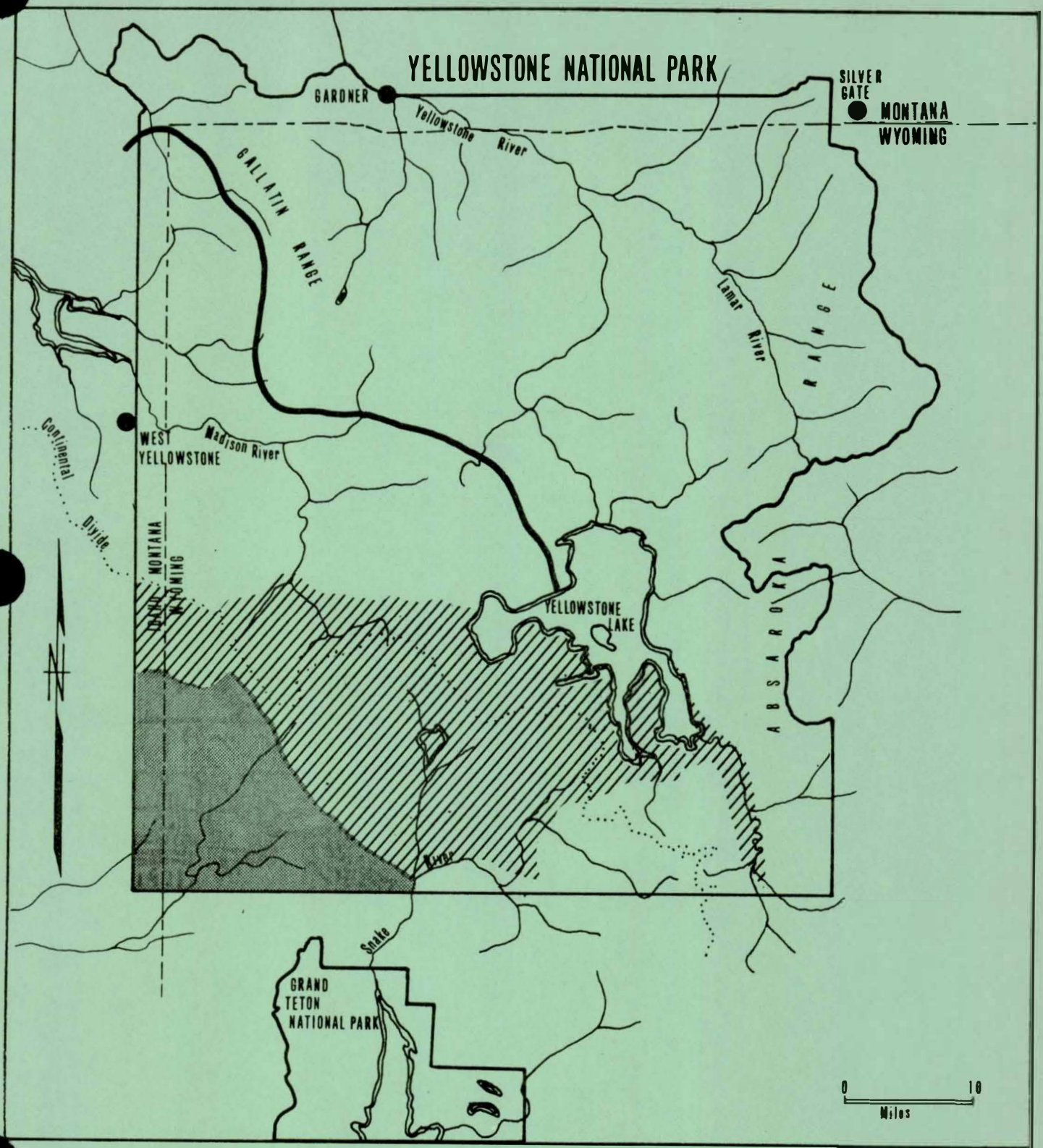

Figure 1.--Mountain pine beetle infestation, Yellowstone National Park

1970 heavy infestation

1971 heavy infestation

Boundary of scattered infestations

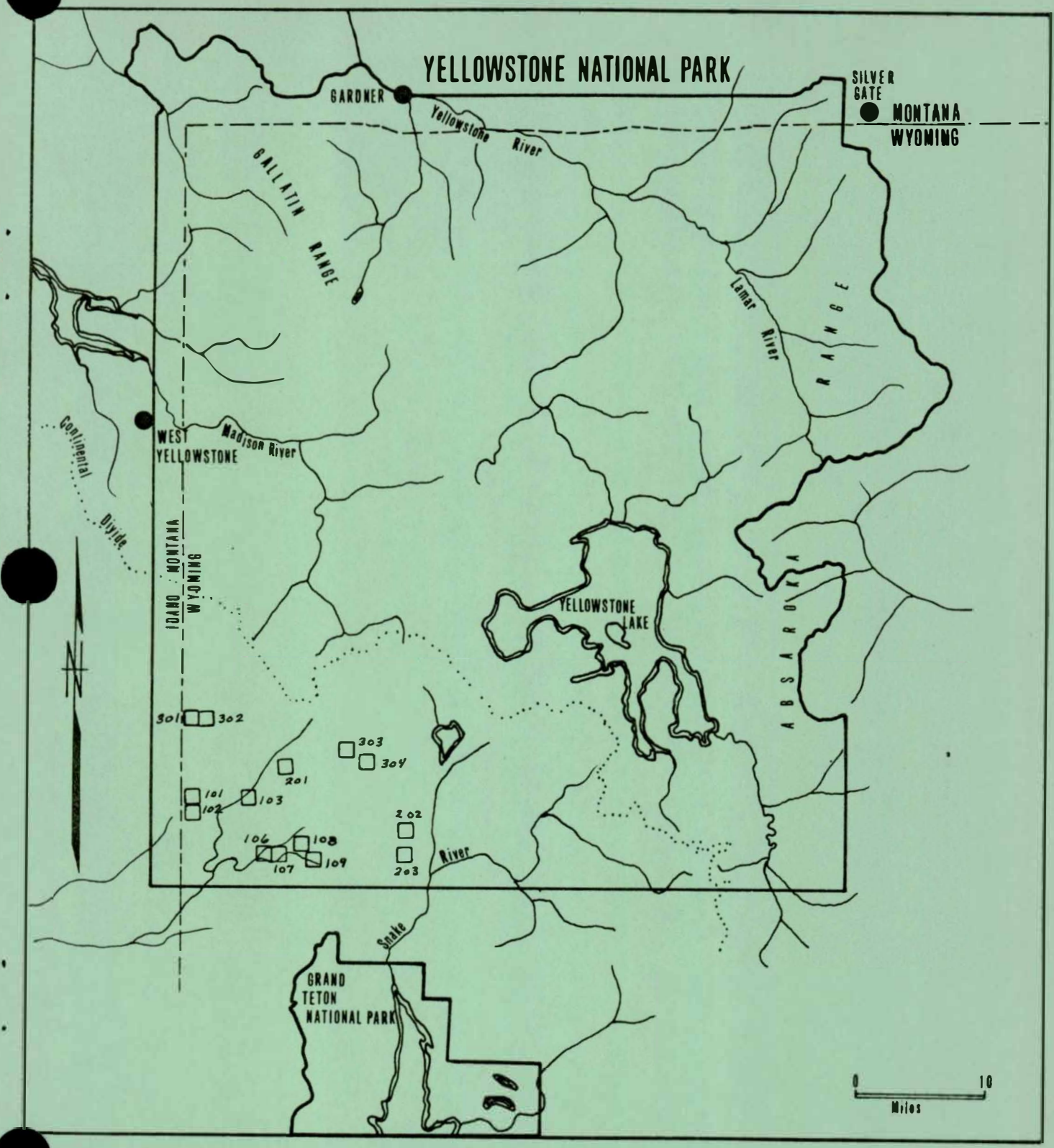

Figure 2.--Mountain pine beetle survey blocks, Yellowstone National Park, 1971

the Horseshoe Lake block and 100 percent of the stand in the Robinson Creek area. No 1971 attacked trees were tallied in the Buffalo Cabin block. The Snow Butte block was the next lowest infested area with 6.8 trees per acre infested in 1971, and 32.2 in 1970. In the Snow Butte area, infested trees averaged 13.0 inches d.b.h. in 1970, and 11.0 inches d.b.h. in 1971. Lodgepole pine averaged 8.0 inches d.b.h. in the remaining green stand. A breakdown of infested trees per acre by survey blocks during 1970-71 is shown in Table 1.

Table 1.--Survey blocks showing trees per acre killed by mountain pine beetle in Yellowstone National Park 1970-71.

Survey block		Trees per acre killed in 1970	Trees per acre killed in 1971
101	Snow Butte	32.2	6.8
102	Robinson Creek	32.1	62.0
103	Bechler Canyon	38.0	28.5
104	Horseshoe Lake	213.6	63.0
105	Cave Falls	113.6	59.6
106	Mountain Ash Creek	25.1	24.1
107	Union Falls	57.6	40.1
108	Pitchstone Plateau	9.7	7.9
109	Beula Lake	27.6	35.8
110	Initial Point	10.6	16.6
201	Douglas Knob	15.4	31.4
202	Phantom Trail	6.8	16.9
203	Polecat Creek	8.9	19.9
301	Buffalo Cabin	.9	0.0
302	Buffalo Lake	6.8	32.3
303	Shoshone Cabin	1.4	20.8
304	Shoshone Lake	2.6	21.6

Stand volume losses varied, ranging from 516 board feet volume per acre at Snow Butte to 3,649 board feet volume at Beula Lake during 1971. Volume loss in board feet and trees killed per acre during 1970-71 are shown in Table 2.

Table 2.--Impact of mountain pine beetle in lodgepole pine stands in Yellowstone National Park 1970-71.

Year	Lodgepole pine killed	Lodgepole pine killed/ acre	Volume killed bd. ft.	Volume killed/ acre	Percent volume loss/ acre	Percent stand killed	Percent of lodgepole pine killed
1970	1,445,598	71.1	57,659,447	2,835	28.9	25.7	28.6
1971	727,500	35.8	36,805,521	1,810	18.5	12.9	14.4
Total	2,173,098	106.9	84,464,968	4,645	47.4	37.6	43.0

In the blocks surveyed, the original stocking was 276.2 live trees (all species) per acre. The stand was reduced to 205.1 trees per acre in 1970 (25.7 percent of the stand killed), and to 169.2 trees per acre 5 inches d.b.h. and larger in 1971 (12.9 percent of the remaining green stand). The survey showed that while 37.6 percent of the total stand was killed, 43.0 percent of the lodgepole pine stand was killed which included 47.4 percent of the volume in the stand.

Parker (1971) found in the Bechler River area 52.2 trees per acre were killed over a 5-year period, reducing stocking from 212.3 to 158.9 trees per acre. This represented 25.2 percent of the stems over 5 inches d.b.h. However, less than 30 percent of the total trees have been killed.

DISCUSSION

Data presented shows losses due to the mountain pine beetle have been extremely high during the past 2 years.

Infestation has spread 30 to 50 miles from where it first reached the Bechler River area in the southwest corner of the Park in 1966. If the infestation follows the same pattern as it did in the Bechler area, we expect the infestation to continue to spread into mature and overmature stands within Yellowstone National Park and also into susceptible stands of the adjoining Gallatin National Forest in Montana. The infestation is far too massive for currently available control methods to have any significant effect.

REFERENCES CITED

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